SULFURIC ACID

CAS Registry Number: 7664-93-9 H_2SO_4

Molecular Formula: H_2SO_4

Sulfuric acid is a colorless, odorless, oily liquid. It is soluble in water and alcohol and is incompatible with organics, chlorates, carbides, fulminates, picrates, and metals (Sittig, 1985). Sulfuric acid decomposes at 340 ^oC into sulfur trioxide and water (Merck, 1989). Fuming sulfuric acid gives off free sulfur trioxide (Sittig, 1985).

Physical Properties of Sulfuric Acid

Synonyms: oil of vitriol; dipping acid; spirit of sulfur; hydrogen sulfate

Molecular Weight:	98.08
Boiling Point:	290.0 ^oC
Melting Point:	10.36 ^oC
Density (liquid):	1.841 (water = 1)
Vapor Density:	3.4 (air = 1)
Vapor Pressure:	1.00 mm Hg at 145.8 ^oC
Conversion Factor:	1 ppm = 4.01 mg/m^3

(HSDB, 1991)

SOURCES AND EMISSIONS

A. Sources

Sulfuric acid is used in the manufacture of fertilizers, explosives, dyestuffs, other acids, parchment paper, and glue. It is also used for purification of petroleum and pickling of metal (Merck, 1989). Sulfuric acid is produced in California (SRI, 1993).

Sulfuric Acid is registered as an adjuvant for pH maintenance in swimming pool and spa water systems. It is also registered as an antimicrobial and bactericide for the control of bacteria in food processing water systems. Sulfuric acid is also registered for use as a disinfectant for cleaning surfaces and equipment in dairy farm milk handling areas, and food handling plants/areas (DPR, 1996).

The licensing and regulation of pesticides for sale and use in California are the responsibility of

the Department of Pesticide Regulation (DPR). Information presented in this fact sheet regarding the permitted pesticidal uses of sulfuric acid has been collected from pesticide labels registered for use in California and from DPR's pesticide databases. This information reflects pesticide use and permitted uses in California as of October 15, 1996. For further information regarding the pesticidal uses of this compound, please contact the Pesticide Registration Branch of DPR (DPR, 1996).

The primary stationary sources that have reported emissions of sulfuric acid in California are manufacturers of fabricated metal products, manufacturers of electronic components and accessories, and manufacturers of measuring and controlling devices (ARB, 1997b).

B. Emissions

The total emissions of sulfuric acid from stationary sources in California are estimated to be at least 2,200 pounds per year, based on data reported under the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

Sulfuric acid occurs naturally in volcanic gases (HSDB, 1993).

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of sulfuric acid.

INDOOR SOURCES AND CONCENTRATIONS

Several studies conducted in the eastern United States found that indoor sulfate levels were less than or similar to outdoor sulfate levels and were predominantly of outdoor origin (Suh et al., 1994; Suh et al., 1992; Brauer et al., 1991). In California, outdoor sulfuric acid is rather low in concentration compared to levels in the eastern United States. An unknown fraction of the indoor sulfate may be in the form of sulfuric acid.

Leaderer et al. (1993) found that unvented kerosene heaters in eastern United States homes increased indoor sulfate levels over outdoor levels. They surmised that the major form of the sulfate was ammonium sulfate. Kerosene heaters could produce some indoor sulfuric acid, but they also produce significant amounts of nitrogen oxides, which would favor the production of nitric acid rather than sulfuric acid. Kerosene heaters are used in about one percent or fewer California homes, but are used more frequently in the eastern United States.

ATMOSPHERIC PERSISTENCE

Once in the atmosphere, sulfuric acid exists as a particle due to its low vapor pressure under ambient conditions. These particles may react with bases present, such as ammonia, magnesium, and calcium, to form salts which act to neutralize the acid. The acid particles may dissolve in clouds, fog, rain, or snow, impacting the earth as wet acid deposition (Finlayson-Pitts, 1986). The average half-life and lifetime for particles in the troposphere is estimated to be about 3.5 to 10 days and 5 to 15 days, respectively (Atkinson, 1995; Balkanski et al., 1993).

AB 2588 RISK ASSESSMENT INFORMATION

Although sulfuric acid is reported as being emitted in California from stationary sources, no health values (cancer or non-cancer) are listed in the California Air Pollution Control Officers Association Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines for use in risk assessments (CAPCOA, 1993).

HEALTH EFFECTS

Probable routes of human exposure to sulfuric acid are inhalation, ingestion, and dermal contact.

Non-Cancer: Sulfuric acid exposure can cause irritation of the eyes, skin and tracheobronchial tree leading to bronchoconstriction and altered lung function. Asthmatics are particularly sensitive to the pulmonary irritation produced by exposure to sulfuric acid. Exposures to other pollutants in industrial areas, including sulfur dioxide, ozone, and metallic aerosols can add to, or potentiate the irritant effects of sulfuric acid (Amdur, 1989). Occupational exposures to sulfuric acid over several months have resulted in dental erosion (NRC, 1986a).

The National Academy of Sciences has recommended an Emergency Exposure Guidance Level (EEGL) of 1 milligram per cubic meter for a 1-hour exposure to protect against serious adverse pulmonary irritant effects (NRC, 1986a).

Cancer: The United States Environmental Protection Agency has not evaluated the carcinogenicity of sulfuric acid (IRIS, 1995). The International Agency for Research on Cancer has classified occupational exposures to strong-inorganic-acid mists containing sulfuric acid in Group 1: The agent is carcinogenic to humans (IARC, 1992).